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THE DEBT OF THE BRITISH EMPIRE TO MEDICAL RESEARCH

By
Col.F.E.Fremantle, O.B.E.,M.D.,M.P.

(An address before the Royal Empire Society, London, January 19, 1932. In United Empire.)

Medical research, though a factor little appreciated in public, is of prime importance to national life at home and overseas. For the primary need of Empire is man power; and the primary need of man is health. That health costs money; but that money, wisely spent, is strictly, quickly and abundantly remunerative. Disraeli declared it impossible to overrate the importance of the subject. "The first consideration", he said, "of a minister should be the health of the people." Lecky referred to "the great work of sanitary reforms" as perhaps the noblest legislative achievement of our age which has probably done far more for the real happiness of mankind than all the many questions that make and unmake ministries." In 1925 the Secretary of State for the Colonies (Mr. Amery) said, "Not the least of the functions of the Colonial Office is to be an Imperial Ministry of Health".

Health and progress depend on research; just as military operation depends on reconnaissance and "intelligence". Without research, action is empirical and progress imperceptible. The story of the Panama Canal is an outstanding illustration of the value of medical research, not least, in this case, to the British Empire, for 1,783 British ships passed through the Canal in 1929. The attempted construction of the canal, by Ferdinand de Lesseps in 1882-9 and by the new Panama Canal Company in 1895-9, failed twice. And why? Largely owing to yellow fever and malaria; 22,000 laborers were lost; 1,000 natives imported from the West Indies and 1,000 Chinese perished within six months. The financial loss was colossal. But by 1900 the channel of infection in yellow fever, having been suspected by Finlay in Havana in 1881, had been confirmed to be a living insect, the Aëdes Aegypti, the Stegomyia fasciata or tiger-mosquito.

Other mosquitoes had been proved by Ross in India to be the channel of infection in malaria. Acting on the logic of these discoveries, Major Gorgas, of the U.S. Army, had cleared Havana of yellow fever. Following the same policy in Panama, Dr. Gorgas---under Goethals as Engineer-in-Chief and Chairman of the Isthmian Canal Commission--was given a free hand and generous supplies. He proceeded on up-to-date lines, clearing bush and swamps, proofing huts, screening and treating cases and suspects, and dealt successfully with the problem at a cost not exceeding one per cent. of the whole capital outlay. It was medical research that enabled the Panama Canal to be opened on August 14th, 1914.

For the story of this revolution in preventive medicine, this new conception of the transmission of disease by insects, with its vast potentialities for the health and development of the Empire, we must go back to the hideous and crippling tropical disease, elephantiasis, so called because of the swellings, especially of the legs, and thickening of the skin which gives superficial resemblance to the skin, limbs and features of the elephant. This is due to the choking of the minute channels, draining the lymph from the tissues which therefore become waterlogged. In 1874, Timothy Lewis, in India, after most painstaking research, found the criminal in the form of embryos of certain threadworms or filariæ; and Bancroft in Australia found the adult worms a couple of years later, in 1876, in

a lymphatic abscess.But it was Patrick Manson in Amoy, China, who in 1877 found, first,that the filaria embryos were present in patients' blood at night and not by day;secondly, that the filaris embryos were present and developed into full-grown filariae in the night-feeding mosquito, Culex fatigans; and, thirdly, that the development of the parasite from embryo to adult in the mosquito was a necessary condition of its existence as a species. In 1900, Low completed the proof by tracing the filariae into the proboscis of the mosquito, through which it is conveyed to the human being when bitten by the infected mosquito.The process,therefore, requires two bites by the mosquito to spread the disease; it bites first an infected human being and takes on board a cargo of embryos; these it develops into adult thread worms, with which it infects its next human victim. This discovery was of fundamental value for the prevention of elephantiasis. War on the mosquito and protection from the mosquito were practical propositions. The disease might with certainty be avoided, possibly exterminated.

Although this epoch-making discovery attracted little attention at the time and even excited opposition and hostility to Manson's views, it became a beacon-light to other enquirers, and there can be little doubt that it influenced later work on the transmission of disease by insects, as,for example, that of Theobald Smith on the Texas fever of cattle,conveyed by ticks, and the classical researches of Ross on malaria. Hence, in many directions, Manson's discovery influenced researches upon both human and veterinary diseases in the tropics and exercised an indirect-but none the less certain-- effect on the development of the British tropics. Medical men, indeed, have in general led the way in biological research, owing to the conditions and demands of their work and training, and have been pioneers in veterinary and botanical research,especially in the tropics.

Manson's conception, however,was based on one not very common disease; we must trace its extension to a wider field. In 1894 he suggested that the malarial parasite—discovered by the French military surgeon Laveran in Algeria in 1880, with a life-cycle in man corresponding to the phases of malaria, worked out from 1885 onwards by the Italian Colgi and others -- had an intermediate host, similar to that of filaria, outside the human body, and a suctorial insect was required for its development. He enlisted the aid of Sir Ronald Ross--then a Major in the Indian Medical Service -- to put his suggestions to the proof.

In 1895, Ross commenced his historic researches in India, working first upon human and then upon bird malaria.By 1898, through enquiries diligently pursued under trying conditions, he had demonstrated in the case of bird malaria the complete development of the parasite in its mosquito host, Culex fatigans, and its transmission from bird to bird by this mosquito. Prior to this he had also been able to work out to some extent the development of the human malarial parasite in the species of dapple-winged mosquitoes or Anopheles. The complete cycle and its effect in transmission of the disease was proved by the Italians, Grassi, Bignama and Bastianelli, after Ross had led the way and after his epoch-making work on bird malaria had become known in scientific circles. From this work and from what he had been able to observe in the case of the human malarial parasite, Ross had come to the conclusion that human malaria was undoubtedly mainly or solely transmitted by mosquitoes and probably by one particular species of these insects.

But Ross was not content merely to indicate how malaria was transmitted. Having proved the method he put the new knowledge into practice and advocated intensive campaigns against the mosquito-carrier of the parasite, proving his case in an effective visit to Sierra Le-

one in 1899.It was on this conception and on the analogy of elephantiasis (or filariasis, as it is now called) and of malaria that the American Commission under Reed, in 1900, incriminated the Stegomyia mosquito as the carrier of yellow fever,in a hurricane campaign against the mosquito,within 12 months completely cleared Havana and its densely crowded population of 250,000 of yellow fever, which had previously devastated it.

The solution of the project for a Panama Canal was thus revealed. In 1903, Panama, having declared its independence of Columbia, signed a treaty with the United States, under which work on the canal was begun in 1907. Twenty million dollars were spent on sanitation, and already,in his 1908 report Colonel Gorgas was able to write, "It is now three years since a case of yellow fever has developed in the Isthmus."

The work of Laveran,Manson,Ross, the Italian observers and the American Sanitary Officers in Cuba and Panama constitutes one of the most remarkable and important chapters in the history of medicine for all time. It has already greatly and advantageously influenced the development of many British tropical possessions, and its benign influence should steadily increase,provided the knowledge gained be properly and, as far as circumstances permit, fully utilized.This revolution in Imperial development is the direct result of medical research.

The hookworm (Ankylostomum duodenale) was found in 1880 by an Italian to be the cause of anaemia of miners making the St. Godhard Tunnel, and in 1854 by Griesinger to be the cause of Egyptian anaemia. In 1898 Looss of Cairo showed how the hookworm entered the human body by penetrating the skin of the foot. Its eggs finding their way into the intestine are scattered from the bowel, and so find their way from polluted earth -- the natural latrine of native races-- into the naked feet of their victims. The anaemia thus caused is responsible for a vast amount of labour inefficiency all over the world--estimated at from 25 to 50 per cent. in the tea gardens of Darjeeling.This problem is now being systematically tackled.It is reckoned that an improved efficiency of only 10 per cent. in the 45,000,000 infected in India would increase their earnings by £50,000,000 a year, and cover the whole of the Indian War Loan in three years.

Malta Fever has now been exterminated in Malta by the researches of the late Major-General Bruce of the British Army Medical Service. The disease, he found, was spread by the milk of infected goats; and it was a simple matter for military discipline to stamp out what had hitherto been a decimating disease in our tropics. The disease is now found to be due to a minute micrococcus, apparently of the same order as that which gives rise to contagious abortion in cattle; and the temperature chart has given it the name undulant fever, by which what used to be called Malta or Mediterrean fever is now known. Twenty-eight cases were reported in the whole war, half of them from South-West Africa, and only one death.

Cholera is, of course,one of the greatest pestilences of all time, and it was the great German research worker,Koch,who,in 1882,discovered the tubercle bacillus, and in 1883 the comma-shaped bacillus or vibrio of Asiatic cholera.From this arose, at a later date, the production of a protective anti-cholera vaccine, and the modern method of treatment which we owe to Sir Leonard Rogers of the Indian Medical Service.

The growth of the bacillus has enabled methods to be found and tested by which the infection can be neutralized, and pure drinking water provided and guaranteed. The result has given us an almost certain safeguard against this disease for those who have the means and the intelligence and will take the trouble,to avail themselves of the necessary methods. In Mesopotamia, where all these methods of protection against tropical diseases, as

and when they arrived, were properly enforced in the last two years of the Great War, pure drinking water was provided not only in the larger stations but also in the smaller posts and units; and whenever an outbreak was threatened by the reports of cases, e.g., in the native population, the long-suffering rank and file of the forces, in addition to inoculation or vaccination against typhoid, smallpox and perhaps plague, were also vaccinated against cholera. The result was only a few cases from time to time, and no outbreak of any serious importance. The same story can be told in our tropical possessions in all parts of the world; another life-saving achievement, to be numbered probably in millions, and the direct result of medical research.

Leprosy.--The hideous disfigurement and mutilation of leprosy--a byword in Biblical and classical history--affecting, it is reckoned, in the present day some 10,000,000 persons of the human race, was found by Hansen in 1874 to be due to a bacillus of its own. This enables us now to distinguish those cases in which the bacillus is still found and the disease is still active and contagious from that large number of cases in which the disease is no longer active, and the patients can safely be returned to normal life.

Here, again, we are indebted to Sir Leonard Rogers, who has worked out the modern treatment of certain drugs, chiefly derived from cholmogra oil, which effect an almost certain cure in early cases. This enables treatment to be effected in out-patient clinics, without the necessary isolation of every case. The cures thus effected encourage patients to come forward willingly for treatment, knowing that they are not thereby to be cast out of society and condemned to a living death. It gives a prospect too of a very great reduction of the disease and of the expensive accommodation required for the life-isolation hitherto considered necessary. It has been a work of wonderful humanity for the natives of South Africa and India.

Sleeping Sickness is due to a single-celled organism with a lash like a pennant, for which it is called a trypanosome. Bodies of this kind were found in 1880 by Evans in India to be the cause of Surra -- a fatal malady in horses, cattle and camels, and in 1894 the hero of Malta fever, Bruce, discovered in Zululand the trypanosome of the African cattle disease nagana, and proved that it was conveyed from wild game, and from sick to sound animals, by the tsetse fly. This enables us to stop the spread of the disease by attacking the habitat of the tsetse fly, especially by clearing the bush round a station or in belts across a country. But more research is required before we can guarantee to individual human beings or cattle living in infected areas such safety as we are able to guarantee in the case of smallpox, for instance, or the enteric fevers.

Beri-beri is an outstanding example of careful observation and continued research, especially by British tropical workers, with valuable effects on a large scale. As many here know, especially those who have lived in Singapore, this disease has a crippling effect on native, especially Chinese, labour. It is of the nature of a neuritis, and the cause was traced by Braddon in 1907, in Malaya, to the eating of polished white rice, and by Stanton and Fraser to the fact that the polishing of rice removes the husk, which contains what we now know as a vitamin necessary for health. Beri-beri, in other words, is a diet-deficiency disease, which is now easily prevented or cured by making up the deficiency.

Scurvy and Beri-beri.--As regards deficiency diseases, in Mesopotamia in the great war the British ration was, on the whole, satisfactory; but in respect of the vitamins which prevent beri-beri it depended on the supply of fresh meat, as the bread was made chiefly with white flour. The Indian ration was rich in these vitamins in consequence of the atta, a wheat flour containing the germ and some of the aleurone layer, and dhall,

containing the germ and coat of the lentil. It was, however, deficient in anti-scorbutic vitamins.

There were no cases of scurvy amongst British troops, probably because of the better condition and the larger quantities of fresh meat and vegetables which they received. There were, however, some cases of beri-beri. such as never appeared amongst the Indian troops, who had plenty of anti-beri-beri vitamins in the atta and dhall.

The cause of the deficiency diseases in Mesopotamia was fully recognized by the D.M.S.and the consulting physician--yourself,Sir# --and steps were taken by them to put the ration scales on a scientific basis. In July, 1916, a revised scale was authorized,and the following table indicates the effect of these changes:--

July 1 to Dec.31	Scurvy (Indians)	Beri-beri (British)
1916	11,445	104
1917	2,199	84
1918	825	51

Tamarind was considered to have anti-scorbutic properties,but the lime-juice issued up to the end of 1916 had no such value,as it was probably over six months old before it was issued.In August,1916, fresh lime-juice was prepared in India from fresh limes, a small quantity of alcohol and salicylic acid being added as a preservative. This gave better results. After the capture of Bagdad, lime-juice was prepared from limes and bitter oranges obtained locally, and issued to the troops with the least possible delay.

The diminution of beri-beri amongst British troops was probably related to the addition of oatmeal and dhall to the British ration in July,1916, to the issue of marmite, and to the issue,at Colonel Willcox's suggestion, of bread containing 25 per cent. of atta. After May, 1917, on receipt of a report from England by Miss Chick and Miss Hume, on the germination of pulses, germinated dhall was used in outlying districts when fresh vegetables or fruit could not be supplied and must have exercised a considerable influence in the prevention of both scurvy and beri-beri.

Plague, bubonic plague,the Black Death of 1347-9--one of the Imperial diseases--due to the bacillus Pestis, discovered in 1894 by the Japanese Kitasato and the French Yersin in Saigon,has been responsible in the last quarter of a century for millions of deaths in India as elsewhere. In 1903, it was proved by Captain Liston,in India,to be transferred by a flea,but only by a particular brand of flea who prefers rats to human beings.This discovery, and the production by Haffkine of a protective vaccine,have enabled us to check,and to a large extent prevent,the spread of outbreaks of the disease,which has a disastrous history in the British Empire from the days of the Plague of London in 1665, with its 97,000 deaths, and indeed long before.Our mastery of the disease is far from complete;but with proper effort it should,by the end of this century,be as rare as yellow fever is to-day.

Dysentery,or the Bloody Flux--the scourge not least of white people in the tropics--is not a disease but a group of symptoms due to various makers of mischiefof which the two most important are an amoeba and a bacillus,discovered, respectively, in 1875 by Losch and in 1897 by Shiga in Japan. The dysentery, due to an amoeba, although it does not occur in epidemics,is noted for the dread liver abscess, to which it gives rise; for its effects in sapping health and energy;and for the chronic condition which, since the war for instance, has filled the hospitals of our Ministry of Pensions. But thanks again to Sir Leonard Rogers, we have in emetin, the active principle of ipecacuanha,a valuable means of treatment;and in proper sanitation a considerable measure of control. Bacillary dysentery, on the other hand, occurs in outbreaks,at home as well as in the tropics,and offers a useful field for further research.

The Chairman

But not least should we mention the triumph of research in the fight with Typhoid and Paratyphoid, A, B, and C, generally known as the enteric fevers. Stewart and Jenner, a century ago, distinguished typhoid from typhus fever; Eberth, in 1880, isolated the typhoid bacillus; and about the turn of the century a vaccine was introduced by Sir Almroth Wright and Sir William Leishman, and anti-typhoid innoculation became practicable. Its value is clearly shown in the official figures for the South African and great wars. In South Africa, between 1899 and 1902, there were 58,000 admissions to hospital and 8,000 deaths, giving ratios of 104 and 14 per 1,000 of strength. In France and Flanders, 1914-18, there were only 7,500 admissions, under 300 deaths, giving ratios of under 1½, instead of 104 admissions per 1,000, and ,08 instead of 14 deaths per 1,000 of strength. A greater proof of the practical value in saving of life, suffering and efficiency from effective application of the findings of medical research could not be left to the imagination.

Let us sum up the practical policy before us to apply these researches to the prevention of disease and the improvement of health throughout the Empire.

Firstly, and above all, it is necessary to promote personal health, alike in the provision of the necessary conditions of working and living and in the personal habits and practice of daily life. Pure food with its proper share and variety of the various factors, including vitamins, salts and freshness, is one essential; pure water and plenty of it another; suitable clothing a third; proper housing and a sufficiency without excess of sunlight and circulating air are no less essential, with satisfactory removal and disposal of refuse and cleanliness of premises and surroundings.

Conditions of work, both in higher and lower grades of employment, European and native, must frankly take account of any insanitary circumstances; prevent or avoid them where possible; and if impossible must temper the wind to the shorn lamb.

The dangers are mental and psychical as well as physical and physiological. Many tragedies of alcoholism, melancholia and suicide are directly due to the rules of the Service and to thoughtless administration.

The nightly, weekly, yearly periods of rest are vital. Irregularities should be fully compensated. Physical or mental rest after physical or mental exhaustion is imperative.

Proper periods of furlough, proper terms of remuneration and pension, are essential.

Enforced celibacy is of the devil, and facilities for family life, for entertainment and social and cultural amusement are necessary. Gramaphones and the wireless, postal services, motors, road, railway, air and steamship communications are of direct value to health in the tropics to meet the needs of efficient work, as shown by physiological and psychological research.

But, secondly, the co-operation of the individual is essential. He must apply the provision so made to his own needs, his capacities and his task, guarding alike against deficiency or excess in any particular; he must curb his own tendencies in certain directions, stimulate them in others; he must watch for the first signs of failure, infection or injury; and take steps, often steps within his own powers, to remedy them. Failure to remedy them must be acknowledged, and help or relief must be demanded in time.

Such cooperation is his duty; such demand is his right; and the conditions here outlined, if mutually observed, have proved themselves to be good business.

Thirdly, however, it is clear, that the authorities--official and non-official -- must take the main steps to protect individuals from infection; to treat and control

the spread of disease; and even international extermination of specific diseases. Isolation of the white from the native population is of great importance, land-drainage, clearance of vegetation, segregation of animals, elimination of the breeding-place of carrier-insects, rat and fly destruction--these are of special importance in the tropics. But here there is no less need of up-to-date sanitary inspection by natives trained to the work, working under trained supervision. The courses of training, examinations and certificates undertaken and issued all over the Empire by the Royal Sanitary Institute have played an invaluable part in the improvement of sanitary conditions; and the power to train and employ natives in such work was nowhere better shown than in Mesopotamia, under the acid test of war, when Arabs and Indians gave excellent service in the incineration of refuse and in the hunt for and destruction of the haunts of the mosquito.

Fourthly, it is necessary that good provision be made available for medical, surgical and obstetrical treatment, both for Europeans and for natives. This, instead of being the fourth, is generally the first and often the only effective medical service provided, for indeed it is the one service which gives confidence and excites compassion; and it corresponds to the instinctive need of humanity, commanding the chief attention even at home alike in practice, in the medical schools and in the public eye, and commanding therefore the highest monetary rewards and the highest public honors. As Jowett, the Master of my College at Oxford, shwredly remarked, "Measures of prevention are never fully appreciated, because when most effectual they are never seen to be necessary."

But a proper service of medical treatment is admittedly essential for the efficiency and credit of any service; and such a service requires higher payment, justified both by virtue of the higher demands now made of it and of the rewards and conditions in medical practice at home with which it has to compete for its personnel. In the tropics it requires white medical officers, nurses and dispensers with good hospitals for Europeans; while, for natives, dispensaries and a subordinate medical, midwifery and nursing service--to be trained locally in the course of time-- will, with all its defects, under proper European supervision give the best results in the end. The work of the medical missions is beyond all praise, and will always play a useful part in the ultimate and main provision for most tropical countries.

On these lines, disease can and is being successfully fought, and life in the tropics at its best is becoming, for healthy men and women, as healthy as life at home.

Consider for a minute the remarkable health figures for the forces in Mesopotamia, British and Indian, including followers, showing a daily sick-rate for non-battle casualities in 1918 of only .19 per cent. of strength as compared with .16 per cent. for France and Flanders that year; and an annual death-rate from sickness reduced from 29 per 1,000 in 1916 to 12 per 1,000 in 1918 for the whole forces; and for British troops only from 43 to 11 per 1,000. The thousands of lives thus saved, the achievements thus made possible, not only for victory but for the future good of the country, must be directly credited in the first instance to the sanitary measures, properly applied without reserve by military authority, based entirely on medical research. Contrast this with the West Indies over a century ago, where 90,000 British troops perished in a few years; with the Walcheren expedition, which failed in 1809, owing entirely to fever, which attacked 30,000 officers and men and killed 3,469; or again with the Crimea, where dysentery and cholera largely accounted for a mortality of 230 per 1,000 of strength; or, finally, with the South African campaign, where over 8,000 deaths were due to enteric fever as compared with 7,000 killed in action. And yet the Medical Department is

considered a subordinate arm of the Service!

As I have said, research and its application require international co-operation, for epidemics spread like wild-fire along lines of communication through susceptible populations, regardless of race. The necessity of quarantine for ships from infected ports has long been recognized; and control under the International Sanitary Conventions, last revised in 1926, is fairly effective. The danger of spread, especially of insect-borne disease, by aircraft is real and serious, and a Convention to deal with it is now in draft. But great progress has been made since the war through the Health Organization of the League of Nations, with its own Health Section at Geneva and with the Office International d'Hygiene Publique in Paris as its advisory committee. Fifty-one Governments are here represented, including those of the British Empire; expert commissions are sent out all over the world from China to Peru to study the prevalence of particular diseases on the spot of their special incidence, to discover their cause, their extent and the means for their prevention, and to give any advice required. A weekly bulletin is published of cases of infectious diseases reported by wireless and cable from every part of the world.

An Eastern Bureau has been established at Singapore, and is proving of special value to all parts of the Empire in and around the Pacific Ocean. The munificent Rockefeller Foundation has given generous and impartial help, not least to the health requirements of the British Empire, with its scientific services of the highest order, soundly based on an ample foundation of efficient world-wide research.

And all over the world, medical research continues incessantly day and night, not only in laboratories but also in the surgeries and studies and courtyards of medical men and women, not for gain but because of the fire within them--their love of the chase, in pursuit of truth, and their love of humanity in the prevention of preventable suffering.

Time was when each such worker worked for his little area, his patients, his immediate problems alone; and most of such work was lost to the world. Now, however, each worker, each center of work, is a collecting station for the world of medical knowledge, conveyed, collated and distributed through all literate nations by countless journals, conferences and discussions.

Of voluntary societies, mention may be made of two which definitely set out to collate and apply the results of medical research to the Empire, namely, the British Empire Leprosy Relief Association, and the British Empire Cancer Campaign.

Of private endowed institutions, the Lister Institute and Sir H. Wellcome's Bureau of Research and Graphic Museum of Tropical Health are the most noteworthy.

Of the official agencies, the Medical Research Council pursues its invaluable work of co-ordinating and inspiring research, carried out in countless laboratories with the assistance of Government grants, free of Parliamentary or departmental interference, under the sheltering auspices of the Privy Council.

But the Colonial Office has also of recent years taken an active interest in the matter of medical research, and its application to the problems for which the Department is responsible. The Colonial Medical Research Committee have issued summaries of the Annual Medical and Sanitary reports of the British Colonies and Dependencies, henceforth to be issued by the Bureau of Hygiene and Tropical Diseases, set up by the Colonial Office; and from the "Papers relating to the Health and Progress of Native Populations in certain parts of the Empire," published last year, there is evidence both of progress being made and of the active influence of Downing Street to that end.

But this progress depends very largely on the special education of those who can take part in it and direct it. The post-graduate teaching of public health, formerly a puny appendix to the medical schools, has been revolutionized in London since the war; and thanks to the generous gift of $2,000,000 from the Rockefeller Trustees and the undertaking of the British Government to maintain it, the London School of Hygiene and Tropical Medicine, in its vast and admirable building behind the British Museum, has concentrated the teaching of Public Health, whether for this country or for the tropics, under one roof as a school of the University of London.

Here, for the first time, the whole subject of Public Health has been properly apportioned between its several divisions and departments under nine professors with other readers and teachers. Research work is carried on, to the benefit of the school as well as of the outside world; the library and the graphic museum are of special value and interest; the short-time courses for laymen--official or civilian--should have a part in the recognized preparation of everyone proceeding to residence in the tropics.

Following his father, the pioneer of tropical health in British policy, Mr. Neville Chamberlain, who laid the foundation stone of this modern temple of health in 1924, has written, "we find ourselves directly interested in the investigation of the diseases associated with the tropics, on the mastery of which depends the prosperity of vast regions within the Empire." One of the most lovable of men and one of the greatest of pioneers in the cause of Imperial Health, the late Sir Andrew Balfour, the first Director of the School, insisted throughout his life on medical research and on appropriate education as the foundation of sound progress in the health of the British Empire. Professor Ray Lankester once declared that if present knowledge could be properly applied, all communicable disease would be stamped out in 50 years. Let this then be our objective.

The promotion of health is not only true philanthropy; it is sound elementary business. As Andrew Balfour has written, "No such crusade under the banner of health has ever been witnessed as that which is now being prosecuted in well-nigh every portion of the British Empire."

I appeal to you, I appeal to the Royal Empire Society, to add your weight in favor of this crusade. It is useless for us to pretend that its importance is recognized. If it were recognized, Manson and Ross, who have saved millions of lives and given incomparable values to the Empire, would surely have been acclaimed and rewarded as fully as the generals and admirals and inventors of the war. If it were appreciated, there would be no stint of money for the research, education and administration required, when millions of pounds are spent on engineering works of far less productive value.

It is to you and to those who, like you, have personal knowledge of the real value of health to the state, to impress these conclusions on your friends; to help to raise the credit of medical research and health work in the public estimate; and to secure the assistance of private benefactors as well as of public authorities in a work so rich in value to the peoples and territories of our world-wide Empire.

After interesting discussion on Women and the Tropics, the Chairman Sir William Willcox, said they had all been astonished at the extraordinary field Colonel Fremantle covered. He seemed to have dealt with almost every disease, and also with the public health aspects of tropical medicine. He supposed there were very few people living who had had such a very wide practical experience of medicine in all parts of the world as Colonel Fremantle. "If I tell you a few of his exploits you will appreciate the sort of man that you have been listening to. He is a fire eater because he was

a war correspondent in the Russo-Japanese War.I can bear witness to the very valuable work Colonel Fremantle did in Gallipoli and in Mesopotamia because I was out with him in both of these seats of the war and I witnessed what he did. He held in Mesopotamia one of the most important medical posts. He was head of the sanitation for the base and for the lines of communication. Basra, as he has told us, was the place where plague and cholera and many of the diseases were being introduced into the war.Then Colonel Fremantle has a brilliant record in this country. He has held most important public health appointments and he has taken a leading interest in housing and everything which is calculated for the better improvement,socially and hygienically, of our nation. Colonel Fremantle has made out a very strong case for medical research, and he has been most ably supported in that by two of our speakers, Dr. Drummond Shiels and Professor Jameson. I am sure everyone in this room will agree with me when I say that not enough money is spent on medical research in this country.It would be a very valuable investment if more encouragement were given to medical research, not only for diseases in England but for diseases in the distant parts of our Empire. I would like to add -- and I know Colonel Fremantle will agree with me--not only medical research but veterinary research. The condition of veterinary medicine in this country is deplorable as regards the support it receives from the State.It is really a public scandal. As we have heard to-night, many of these diseases which afflict men also afflict animals, and medical research and veterinary research go hand in hand. Money that is spent on veterinary research will be advantageous for medical research."

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HAWAIIANS MADE USE OF MANY PLANTS FOR MEDICAL PURPOSES

By
Mrs. Arthur Greenwell

(Before the Garden Club of Honolulu)

Strictly speaking, medicinal plants of the Hawaiian group are not garden flowers, although among them are some of our favorite trees and shrubs;others make our country roads gay with blossoms; still others we look upon as just plain weeds and hasten to pull them up, with no regard for their many virtues, if they intrude among their more aristocratic sisters in our gardens.In former times the Hawaiians made use of almost every plant, but unfortunately much of this knowledge has died out and many of the herbs themselves have disappeared as the lands were opened up for cultivation and grazing purposes. I am sure in the old days the kahunas had their herb gardens as the monks had them in the Old World.Many of these Hawaiian remedies are still in use, the information regarding them having been passed on from father to son. Some herbs were used alone or pounded up with salt, while other remedies combined several plants. Some of these had as many as 18 or more ingredients.This was particularly true of medicine for broken bones. This took several days to collect,as the herbs grew in widely scattered districts.

The wild morning-glory,or convolvulus, of which there are numerous varieties, grows from sea level to far inland, up to the foot-hills. One of the varieties, growing near the sea, the Pohuehue, has long, vigorous runners reaching to high tide mark, heart shaped leaves and deep pink flowers. The roots and stems were eaten in former times when food was scarce,but as an exclusive diet caused dizziness, and its leaves have the same effect on animals.The seeds were in much repute as a cathartic. The Pohuehue is found in most of the South Sea Islands, and it is interesting to note that in the Society Islands

its name is the same as the Hawaiian.

A near relative to the above, the Koali-awahaia, grows on the lowlands and comes up in profusion after the rains. It bears large blue flowers which gradually change through the day from shades of lavender to a delicate pink in the evening. The stems and roots pounded together to a soft mass was used as a poultice to allay pain and prevent inflammation.

The Pilikai, another convolvulus, growing as its name indicates by the sea, has seeds used as medicine. The Uala, or sweet potato, I mention in passing belongs to the same family as the morning-glory.

Our most spectacular wild-flower is the Mexican thistle or Puakala. It grows in dry rocky regions and attains a height of from 2 to 6 feet. It has large delicate white flowers resembling a poppy and whitish green prickly foliage. The Puakala was noticed and mentioned by Captain Cook, and still grows abundantly in favorable localities. Although thoroughly naturalized and found here by the first collectors, it was undoubtedly introduced from the warmer parts of North America.

The root of this plant contains a large percentage of opium, and was used as an opiate for toothache, neuralgia, etc. The thick yellow juice was used for removing warts.

The Noni is a small tree with thick glossy leaves, and has curious potato-like fruit. These are fleshy and juicy, but tasteless, and the ripe fruit has a most disagreeable smell. This tree is a noteworthy example of ancient Hawaiian introduction; and was invaluable to the natives in many ways. It grows from sea level to several fundred feet into the valleys. In former times it was cultivated as a dye plant by the Hawaiians, who secured a yellow dye from the roots and a pink dye from the bark; with the addition of salt a very permanent blue color was obtained. The ripe fruit of this tree is used to this day to relieve sprains, boils and carbuncles. The leaf is a remedy for eczema, it being applied and held in place with ti-leaves. The seeds of the mature fruit are beneficial for indigestion.

Whenever we see or wear an Ilima lei we feel that the plant has fulfilled its mission in life by providing us with these beautiful wreaths. But these flowers as well as the root and leaves of the plant are all useful remedies. These are compounded with other herbs varying according to the malady to be treated. A tonic, for instance calls for 8 ilima roots, a handful of the young shoots and flowers of the Uhaloa, the same amount of the leaves and shoots of the Popolo. This with other plants and sweetened with sugar cane is pressed and strained, and the juice taken so many times a day. The ilima is a lowland plant, growing on poor rocky soil, near the sea. The flowers are quite insignificant on the wild plants, but the cultivated ones are larger and more varied in coloring.

Not only for sickness were remedies provided, but the Hawaiian women, like their sisters of other lands, were not immune to vanity, and enjoyed beauty treatments as much as we all do. A plant called the Alani-kuaiwi was the principal ingredient. This is a tree similar to the orange, with yellowish flowers. Both flowers and leaves are fragrant. The bark is very bitter. It grows in certain localities in the mountains and is found on all the islands. The Alani beauty treatment was reserved exclusively for the royal family, and this would be the treatment given to the queen or princess. Leaves in sufficient quantity were taken and laid on a bed covering the space from the neck to the feet. A sheeting of tapa tightly drawn was stretched over the leaves. In the meantime, in preparation for bathing, twenty leaves were soaked in water over night, and dried in the sun during the day. Towards evening the patient was given certain food to eat and then bathed in this water to which

the Alani flowers were added. After this she was put to bed. This was repeated for five consecutive days. The bedding was then changed and new leaves provided and the process continued for another five days. This treatment not only improved the skin but protected it against certain diseases.

When we think of our drugs being weighed and measured to the least fraction of a grain or ounce, it is interesting to read this Hawaiian prescription:

One hatful of the leaves and buds of the Ala-ala-pu-loa; eight roots; half a hatful of Akoko buds, and two segments of red sugar cane. Pound these thoroughly and then add about two pints of water. Mix the whole carefully and strain. Then add to the cleaned liquid about two tablespoons of burnt Ti-root juice. The entire mixture is then poured into a narrow necked gourd container and shaken. The patient then drinks about a tablespoon of the remedy.

There are many other wayside plants which serve a useful purpose, and some day their virtues may be recognized by science, but until that day comes they will grow and flourish, covering hills and fields with the refreshing greenness so typical to our lovely islands.

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VALUABLE FOODS FOUND IN SEAWEEDS

Certain seaweeds are valuable foods because they contain more iodine and valuable minerals than other foods, although they are seldom eaten in the United States, despite the fact they are basic foods in other countries, according to information made available at the Bureau of Fisheries of the Department of Commerce.

On the Pacific coast, about 15 species of seaweed are found which may be used in the manufacture of agar-agar, the most important edible seaweed in either America or Europe, it was pointed out. Only one plant thus far, however, is located in California. The following additional information on edible seaweed was made available at the Bureau of Fisheries:

Japan, where only 10 species of seaweed are found which may be used in the manufacture of agar-agar, is the world source of agar-agar today.

Irish moss, found in America only along the New England coast, is dried for commercial use principally at Scituate, Mass. Dulse, although not prepared for market, is used as a condiment in some parts of New England.

Seaweeds are used in America principally for their gelatin properties in thickening ice cream, blanc-mange, candies and desserts. Agar-agar is also used in medicine. Seaweed products deserve a much wider use, for they contain more iodine than any other foods, besides other valuable minerals. Vegetables grown near the seacoast and drinking water there contain iodine drawn from the ocean, and from these, people living near the sea obtain the iodine needed by the body, but the inland sections of the country must have it brought to them, and sufficient seaweed in the diet would furnish the necessary iodine.

In some countries seaweeds occupy much the same place as green vegetables. In Japan they are of such commercial importance as vegetable foods that the natural supply is insufficient to meet the demand, so that much attention has been given to their cultivation. In 1929 the Japanese industry amounted to over 827,000,000 pounds of various seaweeds valued at approximately $5,806,930.

More than 70 varieties are used for food by the native Hawaiians, and here, too, some highly prized varieties are cultivated. In Europe, Irish moss is the favorite edible seaweed; green laver and pink laver are used there for soups. Dulse is eaten by the Scotch people and

murlins by the Irish. The Chinese and Swiss ate certain seaweeds to prevent goiter long before the cause of the disease was understood.

Lately a great deal of seaweed or kelp meal has been used, in varying proportions, in the feeding rations of farm animals, and adds to the nutritive value of the ration.

Harvesting difficulties present one of the biggest problems to the California agar-agar industry. It is almost impossible to harvest the moss by machine because the best beds are located under very turbulent waters which soon put out of order any complicated mowing machines. Diving and handpicking is the most successful method and this requires a very industrious type of labor. After all these difficulties only one-sixth or one-fifth of the crude weed comes through as refined agar-agar. It is prepared for the market in two ways. One method consists of drying and bleaching in the sun, and the other consists of making a jelly of it, allowing the water to freeze out, and cutting the residue into thin strips and drying it thoroughly.

Agar-agar is one of the most useful products obtained from seaweeds. It is used in the manufacture of vegetable isinglass, capsules, candy, paints, and culture media for bacteriological research. During the European War it was successfully employed in the treatment of war wounds. It is supplied to the drug trade, commercially in dry transparent crystals that are reduced to a coarse powder for medicinal use. It has the natural property of absorbing water and retaining it; and in medicine, the additional property of resisting the action of intestinal bacteria and of the digestive enzymes. It is prepared by boiling and may be eaten with milk or cream, or mixed with any of the ordinary cereal foods with the addition of salt or sugar.

The Irish moss near Scituate, Mass., is sometimes gathered by hand, but most of it is torn from the rocks by means of specially designed rakes. The rakes are long and have long teeth set close together. The product is prepared for commerce by drying in the sun.

Irish moss of excellent quality is now placed on the market in 1-pound and ½ pound boxes, selling at retail for 45 cents and 25 cents, respectively; it is intended chiefly for making blanc-mange and is used as follows: Soak half a cup of dry moss in cold water for five minutes, tie in a cheese-cloth bag, place in a double boiler with a quart of milk and cook for half an hour; add half teaspoon of salt or less, according to taste. Strain, Flavor with a teaspoonful of lemon or vanilla extract if desired, and pour into a mold or small cups, which have been wet with cold water; after hardening, eat with sugar and cream. To make a demulgent, for coughs, place moss in cold water and heat gently until the liquid is of a syrupy consistence. Then strain and add sugar and lemon to suit taste.

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KELP AND JELLY-FISH

By
W. E. Allen,

(On staff of "Catalina Islander", Biological Feature Service)

THE KELP CROP: For nearly two years we have been reading and hearing a great deal of comment about land crops and crop failures. Wheat and cotton have been especially prominent but a number of others have been mentioned as having been either too big or too little. In some sections it is reported that grasshoppers have removed all question of size of the crop by the simple process of eating up every

growing plant before it had time to become a problem.

Few of us are accustomed to think of the sea as producing crops although it does produce one crop which is harvested in a way somewhat similar to that used for certain crops on land. A little way from the shore near La Jolla and at many other places along the California Coast there are beds (fields) of kelp covering hundreds of acres of surface of the sea.

At the time of our participation in the world war all of these beds received careful attention as crop producers. It had been found that kelp not only contained iodine but that it could be treated so as to yield potash and other materials for fertilizers and a number of other kinds of substances having more or less commercial value. After the close of the war it was found that the costs of harvesting the kelp and extracting these substances were too high to be attractively profitable.

But in the last year or two I have noticed a harvester cutting the kelp for treatment in a factory near San Diego. Naturally the men handling kelp in this way came to regard their crop in the same light that a wheat farmer would regard his crop on land. Therefore, when they found that the kelp beds were disappearing after the hot weather of July they wanted to know what was the matter. One of these men visited the Scripps Institution of Oceanography to see if he could get information there but none was available that was very satisfying.

Such specimens of kelp fronds as could be obtained were heavily coated with crust-like shells of animal growths which seemed sufficient to almost (if not entirely) kill the kelp plants. However, it is probable that these growths were only one of a series of kelp troubles coming with the excessively warm weather. The high temperatures probably made the plants sickly after which animal and plant parasites and hangers on proceeded to injure and to hamper them so much that the fronds dies off at or near the sea surface. Probably they will be as good as ever in a few months. Meanwhile, the harvesters are losing their crop just as land harvesters often lose.

A JELLY-FISH NURSERY: I have known for many years that jelly-fish have certain complications in their successive stages of existence which include one stage in which they are fixed in position like plants and another stage in which they swim about without ever becoming fixed to anything. But I had not known that in the fixed stage they might crowd together and develop enormous colonies looking much like those formed by such plants as mosses and lichens.

On a visit of the U. S. Destroyer Base near National City last fall to see a ship docked for cleaning and painting I was accompanied by Mr. E. H. Myers, a graduate student at the Scripps Institution. While examining the "fouling organisms" composing a rough mass from one to several inches thick on the supposedly smooth bottom of the ship, Mr. Myers called my attention to grayish colored areas which he said consisted mainly of the fixed stage of a common kind of jelly-fish.

A week or two ago we made another trip to see a ship docked and Mr. Myers got great quantities of the animals which he placed in small aquaria in his laboratory room. Every day or two he goes out to the pier and catches a lot of microscopic creatures to feed them, making the catch by hauling a net of fine silk cloth through the water by the pier. He and I have agreed in estimating that about one-third of the bottom of the ship was covered with the attached stage of jelly-fish animals, certainly several hundred square feet in area with a dozen or score of individuals, to each square inch. How they all got food for themselves is a mystery.

But there they were, set closely together like the little seedlings in a nursery seed-bed, before they are thinned out for replanting or

for better growth. The ships on which these colonies are so abundant are those which have been lying idle at the Destroyer Base for two or three years. Evidently there is something about the locality or about the way that the ships lie quietly side by side in the "nests" which makes the place especially favorable for breeding jelly-fish, so that it may be a "nursery" in fact as well as in resemblance. Considering the millions on millions of individuals produced in this nursery, one might expect that enough free swimming jelly-fish would be produced to almost fill San Diego Bay. But, since they are not especially noticeable it seems that few of them ever live to become prominent in the swimming stage.

It is in the free swimming, bell shaped, jelly-fish stage that eggs are produced, from which young are hatched, which live with the parent for a short time before breaking away and finding a place to attach themselves. After one of these young things gets itself fixed on an oyster shell or other solid surface it grows into a small whitish tube a little larger than an ordinary pin and this has a lot of thread-like tentacles surrounding the mouth at the unattached end.

If conditions for growth are especially good, as in the Destroyer "nest" this tube may develop a bud at one side which grows out, breaks away, and becomes like the parent tube. Perhaps new tubular individuals may be developed from this kind of "budding" several times, and that may account in part for the great success of the attached animals in forming large colonies. Just now (in March) Mr. Myers finds that some of the tubular individuals have begun developing different kinds of buds by forming rings behind the tentacles, thus cutting off a section of the outer end of the tube. When released from its tubular parent this bud goes swimming vigourously about as a tiny jelly-fish (a little larger than a pin-head) which needs a lot of food to keep it going just as truly as did the fixed tubular stage. As they get larger these jelly-fish will probably be able to capture small fish as well as other small animals for food. They may become highly injurious to fishes where they are too abundant. On this account, one may be excused for hoping that most of those being developed in the "nursery" will be killed off in some way.

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FUTURE WORK OF APIA OBSERVATORY THREATENED

The observatory at Apia, Western Samoa, was founded in 1902 by the German Government as the result of representations made by prominent geo-physicists. It was eventually equipped for research in seismology, terrestrial magnetism, atmospheric electricity, and electricity. The Germans took great pride in it, and their leading scientists worked there, no expense being spared to make the work complete and efficient. Owing to Samoa's isolated position in the center of a most interesting region, the observatory at Apia soon came to be recognized by the scientific world in general as a very valuable institution--the free use to which the records have been put is sufficient evidence of the importance attached to them.

In 1914 came the great war, and Samoa was one of the first prizes to fall into British hands, New Zealand occupying the Islands. The observatory's work was at once taken over and continued, New Zealand winning international approbation by providing facilities for the maintenance of the work....The New Zealand government still finds itself unable to commit itself to the provision during the next financial year of any larger proportion of the cost of the observatory than was undertaken during the present financial year, a sum totally inadequate to keep the observatory going without outside assistance.

(Extract from the "Fiji Times and Herald)